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AGRICULTURAL MEMORANDUM NO. 410

# County formulae for the estimating of risk of return to capacity before October 31

L P SMITH

Using 30 year data (1940-69) the frequency of return to capacity before October 31st (using the model of Tech. Bull No. 24.) was related to average annual rainfall (R) and average summer potential transpiration (P) with the following results (for years in 10 frequency).

| | |
|---|---|
| NORTH | 5.2 + 0.44R - 0.76P |
| MIDLANDS | 15.2 + 0.48R - 1.4P |
| EAST | 8.0 + 0.22R - 0.66P |
| SOUTHEAST | 3.9 + 0.4 R - 0.66P |
| SOUTHWEST AND WALES | 15.2 + 0.4 R - 1.3P |

These formulae were resonably satisfactory for R less than 35 inches. Using the county averages for potential transpiration and adjusting to sea level (0.2 in per summer six months per 100 feet), it was then possible to obtain county formulae for return date frequency in terms of average annual rainfall and height above sea level. The ADAS regional county divisions then give:

| ADAS Region | County | Rainfall Factor (per inch) | SUBTRACT County constant | ADD Height factor (per 100 ft) |
|---|---|---|---|---|
| NORTH | Northumberland | 0.44 | 7.3 | 0.15 |
| | Cumberland and Durham | 0.44 | 7.5 | 0.15 |
| | North Riding | 0.44 | 7.7 | 0.15 |
| | Westmoreland | 0.44 | 7.9 | 0.15 |
| YORKS & LANCS | East Riding | 0.44 | 7.7 | 0.15 |
| | West Riding | 0.44 | 8.1 | 0.15 |
| | Lancashire | 0.44 | 8.8 | 0.15 |
| E. MIDLANDS | Derby | 0.48 | 9.7 | 0.3 |
| | Nottingham | 0.48 | 9.8 | 0.3 |
| | Leicester and Lincoln | 0.48 | 10.0 | 0.3 |
| | Rutland | 0.48 | 10.2 | 0.3 |
| | Northampton | 0.48 | 10.4 | 0.3 |
| W. MIDLANDS | Stafford | 0.48 | 9.7 | 0.3 |
| | Hereford and Shropshire | 0.48 | 9.9 | 0.3 |
| | Cheshire | 0.48 | 10.0 | 0.3 |
| | Warwick and Worcester | 0.48 | 10.2 | 0.3 |

/EAST

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| ADAS Region | County | Rainfall Factor (per inch) | SUBTRACT County constant | ADD HEIGHT factor (per 100 ft) |
|---|---|---|---|---|
| EAST | Holland | 0.22 | 3.9 | 0.15 |
| | Bedford, Huntingdon Cambridge | 0.22 | 4.1 | 0.15 |
| | Hertford, Norfolk Suffolk | 0.22 | 4.2 | 0.15 |
| | Essex | 0.22 | 4.4 | 0.15 |
| SOUTHEAST | Oxford Hampshire Sussex | 0.4 | 8.2 | 0.15 |
| | Berkshire Buckingham Surrey | 0.4 | 8.3 | 0.15 |
| | Isle of Wight | 0.4 | 8.5 | 0.15 |
| | Kent | 0.4 | 8.6 | 0.15 |
| SOUTHWEST | Gloucester | 0.4 | 8.6 | 0.25 |
| | Somerset Dorset Wiltshire | 0.4 | 8.8 | 0.25 |
| | Devon | 0.4 | 9.0 | 0.25 |
| WALES | Denbigh | 0.4 | 7.7 | 0.25 |
| | Flint | 0.4 | 7.8 | 0.25 |
| | Montgomery | 0.4 | 8.2 | 0.25 |
| | Monmouth | 0.4 | 8.5 | 0.25 |

If R is average annual rainfall (below 35 inches) and H the height (in hundreds of feet) above sea level, then the chances out of 10 of a return to capacity before October 31st can be found from

$$RA - B + HC$$

where A = rainfall factor
B = county constant
C = height factor

Example Taking two stations at random:-

e.g. Shrewsbury (Shropshire) R = 25.75 H = 1.84 A = 0.48 B = 9.9 C = 0.3

Frequency = 12.35 - 9.9 + 0.55 = 3.01

Number observed in 30 years = 9

e.g. March (Cambs) R = 23.07 H = 0.08 A = 0.22 B = 4.1 C = 0.15

Frequency = 5.07 - 4.1 + 0 = 0.97

Number observed in 30 years = 3

Any comments or suggestions on this paper should be referred to the author.

Meteorological Office
Bracknell

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